

NONNULA CINERACEA, sp. nov.

Supra cineracea, dorso alis extus et cauda obscurioribus; loris et ciliis oculorum albis: subtus pallide fulva, ventre crissoque albis; subalaribus et remigum marginibus internis pallide cinnamomeis; rostro obscure plumbeo, ad basin flavicante; pedibus plumbeis. long tota 5·0, alæ 2·6, caudæ 2·1, rostro a rictu 1·0.

Hab. Amazonia superior.

Mus. Brit.

Obs. Species *N. rubeculæ* proxima, sed colore dorsi cineraceo et pectoris valde dilutiore distinguenda.

The single specimen of this species is in the British Museum, where it is marked *Nonnula frontalis* in the handwriting of the late Mr. G. R. Gray. I do not, however, think that it can in any case be referred to that species. The skin in question was received from Mr. Bates through Mr. S. Stevens in 1853, and, as Mr. Bates kindly informs me, was one of a series obtained by him at Ega from a French collector who had been up the Rio Javari. It is labelled "iris châtain, bec bleu."

My specimen of *Brachygalba albigularis* (see Mon. Galb. et Bucc. p. 45) was procured by the same collector; and examples of *Bucco col-laris* and *Malacoptila rufa* in Brit. Mus. are from the same source.

7. On the Conformation of the Thoracic End of the Trachea in the "Ratite" Birds. By W. A. FORBES, B.A., F.L.S., Prosector to the Society.

[Received June 21, 1881.]

In the present communication I propose to follow out the line of work developed by the late Prof. Garrod in his paper on the trachea of the Gallinæ¹, by describing in detail the structure of the bifurcating trachea in the "Ratite" birds.

So far as I am aware, no proper description of this structure in the birds in question has ever been given, though the statement, apparently originally due to Meckel², that in them "there is no lower larynx," has been very generally followed and copied, even in the latest text-books on the subject³. Prof. Owen has briefly described the bifurcating trachea in the Ostrich⁴ and Apteryx⁵; and his accounts, as far as they go, are accurate enough. More recently E. Alix has very briefly mentioned some peculiarities of this part in the Rhea; and his account will be found quoted below.

¹ "On the Conformation of the Thoracic Extremity of the Trachea in the Class Aves. Part I. The Gallinæ," P. Z. S. 1879, pp. 354-380.

² 'Traité général d'Anatomie comparée,' x. p. 571, 1838.

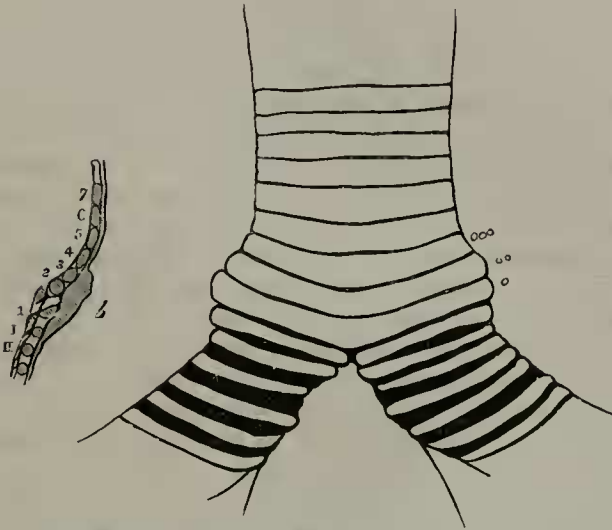
³ Cf. Huxley's 'Anatomy of Vertebrates,' p. 313; Macalister, 'Morphology of Vertebrates,' p. 161.

⁴ 'Catalogue of the Physiological Series of the Museum of the Royal College of Surgeons,' ii. p. 103, prep. 1159 (1834).

⁵ Trans. Zool. Soc. ii. p. 279.

Struthio camelus (figs. 1, 2), on account of its size and simple structure, may be described here first. The trachea, inferior to the

Fig. 1.



Bifurcating trachea of *Struthio camelus*, from before.

b. Section of wall of trachea, from behind, to show the vocal cord formed by the thickening of the mucous membrane of the interior. I, II., first two bronchial semirings. 1, 2, &c., last tracheal rings.

Here, and elsewhere in these figures, o indicates the last, oo the penultimate, ooo the antepenultimate tracheal rings.

Fig. 2.



The same, from behind. About natural size.

insertion of the *sterno-tracheales*, slightly narrows, having above the antepenultimate ring a diameter of about one inch. The tracheal

rings are here, as elsewhere, entire simple rings, of an average depth of about .15 inch, and are separated only by very slight interannular intervals. The trachea is slightly compressed and posteriorly carinated for about the last 7 rings. The last ring but four is somewhat produced downwards in the middle line, both anteriorly and posteriorly ; it is, in consequence, narrower laterally than elsewhere. The antepenultimate ring presents the same features more strongly developed. In two of the four specimens examined it sends down a small pessuliform process of cartilage in the middle line behind, filling the chink left between the posterior extremities of the two next (incomplete) rings. The penultimate ring is narrower and more cylindrical than its predecessors ; it is also wider transversely, and incomplete behind in the middle line, its extremities, however, being closely approximated to each other. The last tracheal ring is still wider transversely, and more cylindrical ; and it too is incomplete posteriorly, to a greater extent than its predecessor ; viewed from the side it is convex upwards, as are its few immediate predecessors in a less degree. The interannular intervals between all these rings are, when undisturbed, mere chinks filled up by dense fibrous and elastic tissues. There is no trace of a pessulus, though the last tracheal ring is slightly produced downwards in front. The first bronchial semiring, on each side, is narrow and cylindrical, strongest anteriorly, and somewhat attenuated posteriorly. It is separated only by a narrow interval from the last tracheal ring. The second and third rings are similar, but are more slender and lengthy ; they are convex *downwards*, but very slightly so ; hence the interannular intervals are small here also. Their anterior ends are very slightly inturned, impinging but to a small extent on the *membrana tympaniformis*, which completes the bronchial tubes internally, and, in consequence of the absence of any three-way piece, passes continuously from one bronchus to the other, so closing the tracheal tube inferiorly. The fourth, fifth, and succeeding bronchial rings are similar in character ; but their ends, which tend to be dilated posteriorly, are successively more and more incurved to about the tenth. Nowhere are the bronchial rings complete.

There is, at most, only a trace of a *membrana semilunaris*, in the form of a very feeble, scarcely raised, antero-posteriorly directed fold of mucous membrane.

Internally, the mucous membrane of the interior is greatly thickened, forming a vocal cord, in the region of the last three tracheal rings and first two bronchial semirings (vide fig. 1, b).

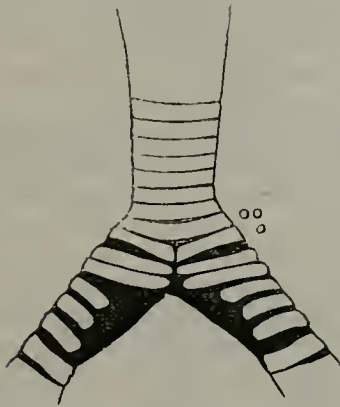
There is no trace of any intrinsic voice-muscle ; and the lateral tracheal muscles stop at the point of insertion of the *sterno-tracheales*.

The genus *Apteryx*, in the simplicity of the structure of its lower larynx, stands on the same level as *Struthio*. In *Apteryx mantelli* (figs. 3, 4) about the last dozen tracheal rings are quite simple in form, with narrow interannular intervals, and no anterior and posterior notching. The penultimate ring is produced slightly downwards, in a triangular way, both anteriorly and posteriorly. The last ring is also produced downwards anteriorly, but is incom-

Fig. 3.

Bifurcating trachea of *Apteryx mantelli*, from before.

Fig. 4.



The same, from behind. About twice the natural size.

plete in the middle line behind; it is slightly wider and stronger than the preceding rings. The first two bronchial semirings on each side closely resemble it in form; the first semirings of opposite sides are almost in contact at both extremities, the next pair being more widely separated at those joints. There is only a narrow space between the last tracheal and the first bronchial ring. The succeeding bronchial semirings are perfectly simple, rather deep and stout pieces of cartilage, separated by narrow interannular spaces, and completed internally by a broad *membrana tympaniformis*; nowhere do they become complete circles. As in *Struthio*, there is no pessulus, and no intrinsic muscle. There is a slight antero-posteriorly directed vertical fold of mucous membrane between the two bronchial apertures internally, and also a feebly developed vocal cord on the external wall of the bronchi, where they diverge from the trachea. The lateral muscles stop some way before the end of the trachea, at the place where the *sterno-tracheales* are inserted. *Apteryx australis*, *A. haasti*, and *A. oweni* have all been

examined by me, and all agree closely in their tracheal structure with *A. mantelli*. My specimens of *A. australis* and *A. oweni* (two) agree together in having the last three tracheal rings incomplete posteriorly; whilst in *A. mantelli* and *A. hausti*, of which I have seen only single specimens, the last ring alone is incomplete.

In the *Casuariidæ* we meet with peculiarities in the structure of the bifurcating trachea not existing in the other "Ratitæ." In *Casuaris galeatus* (figs. 5, 6, p. 783) the trachea is somewhat dilated for the terminal inch or so of its extent, transversely and also posteriorly. The last tracheal rings (for a number varying in different specimens, in the specimen in question 12, in another 23) are incomplete in the middle line behind, though the posterior ends are closely approximated together¹.

These rings are tolerably uniform in breadth posteriorly, tapering only somewhat at their extremities; the interannular intervals are mere chinks. Anteriorly, however, the rings being dilated in the median line and attenuated laterally, the intervals are better developed. The last 5 or 6 rings are more and more curved downwards anteriorly, whilst their posterior moieties are somewhat dilated, their ends gradually receding more and more from each other in the middle line. There is no trace of a *pessulus*.

The first bronchial semirings much resemble the last tracheal rings, their anterior extremities being closely approximated together, and their posterior ones dilated, and somewhat pointed, terminally. The second, third, and fourth bronchial semirings are simple cartilaginous hoops, tolerably deep, separated only by narrow intervals, and, as usual, completed internally by a *membrana tympaniformis*. The fifth, sixth, and seventh are similar but longer semirings, the sixth and seventh being dilated anteriorly. The succeeding rings are similar but quite simple hoops, never forming anywhere complete circles.

There is no trace of any intrinsic muscles. The *sterno-tracheales* are inserted on the trachea at about the twelfth ring from the last. Anteriorly they expand on the tracheal wall, and are in contact with each other over the middle line, as is also the case in *Dromæus*, though not in the other three genera. A small part of each muscle runs to be inserted into the posterior wall of the trachea near the margin. The lateral muscle of the trachea passes between these two portions of the *sterno-trachealis* of its side, but does not pass down further than the commencement of the tracheal tympanum.

¹ Between the extremities of each imperfect tracheal ring runs a short band of connective and elastic tissue, with the fibres running transversely. These extend the whole length of the trachea, and when well developed have the appearance of a longitudinal band running along the middle line of the tube posteriorly. By the contraction of these fibres, the ends of the tracheal rings, where these are incomplete, or their more slender middle portions where perfect, are drawn together, and pressed into the interior of the tube, so forming what at first sight looks very much like a longitudinal, though incomplete, tracheal septum, such as is found in some Procellariidæ and other birds. In consequence of this structure, a transverse section of the tracheal tympanum posteriorly presents two strong convexities separated by a median concavity.

Fig. 5.

Bifurcating trachea of *Casuarinus galeatus*, from before.

Fig. 6.

The same, from behind. About natural size. The portion of the *sterno-tracheales* muscles at their insertion is represented in each figure.

As compared with *Struthio* and *Apteryx*, all the tracheal and bronchial rings are much less firm and more cartilaginous in *Casuaris*, as also in *Dromæus*.

The *membrana tympaniformis* completing the trachea below is a simple membrane, passing continuously from one bronchus to the other, with no intervening pessulus.

Internally, a very slight thickening of this membrane in an antero-posterior direction, at the bifurcation of the tube, may be seen; but there is nothing that can be properly called a *membrana semilunaris* present. The external vocal cord, on the other hand, situated over the first two bronchial semirings, is very well-developed, with a sharply-defined margin.

On the internal wall of the bronchus there is, in addition, a second, much slighter and less prominent fold, slightly concave forwards, running somewhat obliquely backwards and downwards, and supported by the anterior ends of the third and sixth bronchial semi-rings.

Besides *Casuaris galeatus*, I have examined tracheæ of *CC. beccarii*, *bennetti*, *uni-appendiculatus* (2 specimens), and *westermanni*; and in none of these species can I detect any difference of importance from the arrangement I have described above. In the last-named species (an adult specimen) there is a considerable amount of ossification in the last tracheal and first bronchial rings. The mucous fold on the internal walls of the bronchi varies much in development in different specimens. In adults there is a great accumulation of the fibrous and elastic tissues of the mucous membrane in the region of the tracheal tympanum.

Of *Dromæus novæ-hollandiæ* I have only, as yet, been able to examine one trachea, and that too from a young specimen. This closely resembles that of *Casuaris*; but the number of imperfect tracheal rings seems to be considerably smaller, in the specimen in question only the last three being incomplete behind. The third and fourth bronchial semirings are considerably stronger than the first two and the immediately preceding tracheal rings. There is no *pessulus*; but the *membrana semilunaris*, especially posteriorly, seems to be better developed.

The insertion of the *sterno-tracheales* is as in *Casuaris*. The lateral tracheal muscles extend down to within about 1.5 inch of the end of the trachea.

In the genus *Rhea* (as represented by *R. americana* and *R. macrorhyncha*) a very different condition of things occurs, there being a highly-specialized and peculiar syrinx, provided with a pair of intrinsic muscles¹.

¹ I had observed the peculiar syrinx of *Rhea* some months before I met with M. Alix's short paper on this bird in the "Bulletin" of the Société Philomatique for 1874 (p. 38), in which he points out, for the first time, the fact that *Rhea* possesses a true syrinx. His account, which I here reproduce, runs as follows:—"Il y a chez le Nandou un larynx inférieur. Les cordes vocales sont placées à l'origine des bronches, dont les premiers anneaux sont incomplets, en sorte que la paroi interne qui leur correspond a l'aspect d'une membrane tympaniforme. Le reste des bronches est formé par des anneaux complets." This description is, as will be seen, very incomplete, and, in the last statement, incorrect.

In *Rhea americana* (figs. 7, 8) the average diameter of the trachea anteriorly is about 1 inch, and it is somewhat compressed from before backwards. The cartilaginous tracheal rings are complete behind.

Fig. 7.

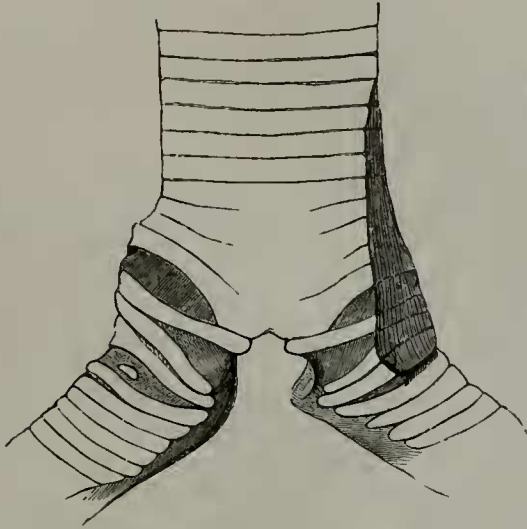
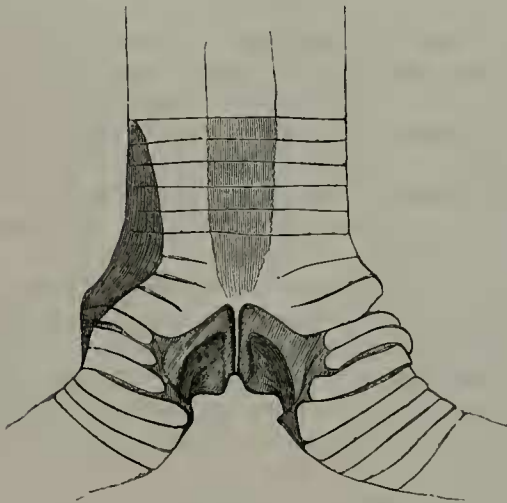
Bifurcating trachea of *Rhea americana*, from before.

Fig. 8.



The same, from behind. About the natural size. The intrinsic muscle has been removed on the right side. In fig. 8 the fibrous band running down the middle of the trachea posteriorly, as described above in *Casuaris*, is also represented.

and closely approximated to each other. The last four tracheal rings are soldered together to form a cartilaginous box, the constituents of which are marked out by the interannular sutures, which are only interrupted in the middle line anteriorly and posteriorly.

The exact number of tracheal rings which are fused to form this box varies in different specimens from four to six; in some cases it is, apparently, formed by four rings on one side and five on another. The lowest tracheal ring is strongly concave downwards, but in front in the middle line is transversely truncated. Posteriorly the tympanic box is deeply and widely notched. There is a distinct, narrow, cartilaginous *pessulus*, which runs from behind forwards, connecting the anterior and posterior walls of this box, and interrupting, in the mid line, the continuity of the *membrana tympaniformis*, which completes the bronchial walls internally.

The first bronchial semiring is nearly straight, and of cylindrical form. It is closely connected at its extremities with the last tracheal ring; but between these points is a pretty wide, lunate, interannular interval. The anterior ends of these first semirings are inturned considerably, but do not meet each other, or the *pessulus*; posteriorly they do not extend inwards, by some way, as far as the preceding or succeeding rings. The second bronchial semiring is similar in form, but dilated slightly behind; it is closely approximated to the preceding ring in the greater part of its extent, but is anteriorly strongly curved downwards (in a somewhat sinuous way), so that here a considerable space is left between the two semirings in question. The third and fourth rings are considerably dilated, and produced inwards, posteriorly; anteriorly, in the particular specimen figured, they are fused into a comparatively narrow ring. The fifth, sixth, and succeeding semirings are quite simple incomplete hoops of cartilage, which become smaller and less complete internally as they approach the lungs.

Between the *pessulus* in the middle line and the tracheal box and first four bronchial semirings, is spread a membrane, completing the tracheal and bronchial walls at the bifurcation of the tube. This *membrana tympaniformis* is thinnest posteriorly; but in the middle part of its extent, over a triangular area—the base of the triangle resting on the *pessulus*, whilst the apex is at the posterior end of the fourth bronchial semiring—it is thickened and of a fibro-cartilaginous consistency.

From the sides of about the last ten tracheal rings a single thin but broad band of muscle arises, the fibres of which, running downwards and forwards, are inserted into the anterior halves of the first five bronchial semirings and the membranes between them, extending, in some specimens, almost to the anterior tips of the first two semirings. This muscle is therefore in all respects a true intrinsic syringeal one. The lateral tracheal muscle stops anteriorly to the origin of the intrinsic one.

Internally, there is a well-marked, sharp-bordered *membrana semilunaris*, resting on the *pessulus*, developed between the bronchi. In the space corresponding to the interval between the last tracheal and first bronchial rings, an accumulation of the fibrous and elastic tissues of the living membrane of the bronchus gives rise to a well-developed vocal cord.

Rhea macrorhyncha closely resembles, in all respects, *R. americana*

in the structure of its syrinx. In the single specimen I have by me, the tympanic box is anteriorly marked by four sutures on one side, and by three only on the other, as sometimes happens in *R. americana* (as, e. g., in the specimen described and figured above).

Reviewing the facts herein detailed, the most striking fact that comes out is the great difference exhibited by *Rhea* when compared with the four other genera described. In the possession of a tracheal box formed by the fusion of the few last tracheal rings, in the greater amount of specialization of the first two bronchial semirings of each side, in the presence of distinct interannular membrane-covered fenestræ, in the development of a well-marked cartilaginous *pessulus*, and in the possession of a pair of true intrinsic syringeal muscles running from the trachea to the bronchial semirings *Rhea* stands out by itself as sharply opposed to all the remaining "Ratite" birds. Of the latter, *Struthio* and *Apteryx*, as far as regards tracheal structure, form one group, the Casuariidæ another, the difference between the two being, however, comparatively slight as compared with those between them generally and *Rhea*.

Struthio and *Apteryx*, in the tendency of the trachea to narrow before its bifurcation, in the greater amount of solidity of the cartilaginous structures, in the more sharply-defined junction between the two constituent parts of the bifurcating trachea, owing to the better development of the few last tracheal rings, differ from the Casuariidæ, where the terminal part of the trachea tends to develop into an expanded *tympanum*, the cartilaginous structures are softer and more pliant, the terminal tracheal rings are narrower and tend, especially in *Casuarius*, to become imperfect posteriorly, and the junction of trachea and bronchi is less marked. In the Casuariidæ, too, the insertion of the *sterno-tracheales* is different from that of the other genera.

As regards the alleged absence of a lower larynx (or "syrinx") in these "Ratite" birds, it is obviously untrue as regards the genus *Rhea*. In the other genera, an answer is less easy, and its nature must depend upon what is meant by the term "lower larynx."

The presence of intrinsic voice-muscles cannot be regarded as essential in the definition of that term, any more than the development of a *pessulus*; indeed either or both (e. g. *Conopophaga*) may be absent in birds with well-developed vocal organs. If the presence of semirings externally, and of a *membrana tympaniformis* internally, forming the walls of the bronchi, and of vocal cords developed in the interior of those tubes, be held to be sufficient to characterize a "syrinx," then it will be incorrect to say that the Ratite birds have no voice-organs¹. As I have here shown, all these three structures are

¹ It is sometimes, though most erroneously, supposed that because a bird has no intrinsic voice-muscles, it is, therefore, mute. Were such the case, all the Gallinæ, Ducks, *Chauna*, and many other noisy birds should be voiceless. As regards the Ratitæ, the statement made by Meckel that they are mute or nearly so (*l. c.* p. 571), is, I believe, equally groundless. I am assured by Mr. Bartlett that all, except perhaps the *Apteryx*, have the power of making considerable noises. As regards the Ostrich, indeed, Livingstone states that it is frequently difficult to distinguish its bellowing from the roaring of the Lion.

present, variously developed, in the genera in question, together with at least a rudiment of a *membrana semilunaris*. If a bird existed with its tracheal rings in no way modified at the bifurcation, with the bronchi, in their course thence forward to the lungs, completely encircled by tracheiform rings of simple form, and with no vocal cords or semilunar membrane, it might be said with truth that in such a form "there is no lower larynx." But, so far as I know, no existing bird possesses so simple an arrangement, though some of the Cathartidæ approach such a type very nearly.

8. On some Flycatchers lately added to the Collection of the British Museum. By R. BOWDLER SHARPE, F.L.S., F.Z.S., &c., Department of Zoology, British Museum.

[Received June 17, 1881.]

(Plate LXVII.)

The acquisition of the Gould collection has naturally added a large number of skins to the national collection; and it has increased our series of Flycatchers considerably, so that I am enabled to correct some errors which have crept into the Catalogue of Birds.

Genus ZEOCEPHUS, Bp.

(Cf. Sharpe, Cat. B. vol. iv. p. 343.)

I have now for the first time seen the adult male of *Zeocephus rufus*; and I find it to be a long-tailed bird, resembling a *Terpsiphone*; and it is doubtful now whether *Zeocephus* can be separated as a genus from the above-named one. The male of *Zeocephus rufus* is similar to the bird described by me (*l. c.*), which must have been a female, but differs in its richer chestnut plumage and in its elongated central tail-feathers, which measure 7 inches in length.

TERPSIPHONE SMITHII (Fraser).

Muscipeta smithii, Fraser, P. Z. S. 1843, p. 34; Allen and Thomps. Exped. Niger, ii. p. 492.

Tchitrea smithii, Hartl. Orn. West-Afr. p. 91; Cass. Pr. Philad. Acad. 1859, p. 42; Hartl. J. f. O. 1861, p. 168; Gray, Hand-l. B. i. p. 333, no. 5018.

Terpsiphone smithii, Finsch and Hartl. Vög. Ostaf. p. 312, note.

The type of this species is in the Gould collection; and I was surprised to find what a good species it really is, and how different from *T. rufiventris*, with which I had united it. In fact it comes nearest to *T. tricolor*, from which it differs in its rufous back.

MALURUS CYANOCHLAMYS, sp. n.

Malurus cyaneus, Sharpe, Cat. B. iv. p. 286 (nec Ellis).

Adult male. Similar to *M. cyaneus* of New South Wales, and, like that species, having the head, ear-coverts, and mantle of the same